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BRIEF SUMMARY OF THE INVENTION

The present invention is made to solve the above problems and its object is to provide an image-forming device and a method for controlling the device, which make it possible for a user to print out the information particularly noted by the user by designating a modification method in accordance with a condition desired by the user when printing out machine control information or operator information in the form of a list or report.

To achieve the above object, a first aspect of the present invention provides an image-forming device comprising:

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        a device-information-holding module which holds
15    inherent device information including control
    ·    information to be possessed by the image-forming
        device;

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        a condition-setting module which sets a reference
        value to specific device information of the above
20    device information as a condition;

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a character-data-generating module which fetches the device information from the device-information-holding module, determining whether the device information meets the condition set by the condition-setting module, adding predetermined color information to the device information in accordance with the determination result, and converting the device

information including the predetermined color
information into character-string data;

an image-data-generating module which converts the
character-string data converted by the character-data-
5 generating module into character-image data;

an image-data-storing module which stores the
character-image data converted by the image-data-
generating module; and

an image-forming module which reads the character-
10 image data from the image-data-storing module and
forming an image based on the character-image data on
an image-recording medium,

wherein the image-forming module has a function
for applying coloring or character modification to the
15 specific device information under a specific condition
and printing out the information when printing out the
above device information.

According to the first aspect of the present
invention, it is possible to easily extract the
20 information intended by a user when printing out a list
or report in accordance with the data output from the
image-forming device.

Moreover, a second aspect of the present invention
provides the image-forming device according to the
25 first aspect and further comprising a user interface
for displaying a condition to be set by the condition-
setting module.

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According to the second aspect of the present invention, it is possible to easily extract the information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a third aspect of the present invention provides the image-forming device of the first aspect, in which the image-forming module has a function for printing out the character-image data by coloring or modifying the character-image data in accordance with preset conditions when printing out the device information.

According to the third aspect of the present invention, it is possible to easily extract the information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a fourth aspect of the present invention provides the image-forming device according to the first aspect, in which the image-data-generating module has a function for determining whether an item designated by a user meets a condition designated by a user when generating a number-of-sheet-used-information list or report every user group, coloring the item with a color designated by a user or applying character-string modification to the item by a modification method designated by the user to

generate character-image data when the item meets the condition, and

the image-forming module has a function for coloring the character-image data with a color designated by the user or applying character-string modification to the list or report by a modification method designated by the user and printing out character-image data.

According to the fourth aspect of the present
invention, it is possible to easily extract information
intended by a user when printing out a section control
information or the like in accordance with the data
output from the image-forming device.

Furthermore, a fifth aspect of the present
invention provides the image-forming device according
to the first aspect, in which the image-data-generating
module has a function for generating character-image
data by applying respectively-inherent character
modification to the specific device information under
a plurality of conditions, and

the image-forming module has a function for generating character-image data by applying respectively-inherent character modification to the specific device information or specific control information under a plurality of conditions.

According to the fifth aspect of the present invention, it is possible to extract more information

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intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a sixth aspect of the present invention provides the image-forming according to the first aspect, in which the image-forming module has a function for stepwise coloring each of the character-image data values with an inherent color about one item and printing out the data correspondingly to a preset number of conditions when printing out the device information.

According to the sixth aspect of the present invention, it is possible to easily extract more complex information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a seventh aspect of the present invention provides the image-forming according to the first aspect in which the image-data-generating module has a function for determining whether to meet any stage of a plurality of conditions designated by a user about one item designated by the user when generating a number-of-sheet-used-information list or report every user group and generating character-image data by coloring the data with a color designated by the user in accordance with a stage meeting one of the conditions, and

the image-forming module has a function for printing out the character-image data by coloring the data with a color designated by the user in accordance with a stage meeting one of the conditions.

To achieve the above objects, an eighth aspect of the present invention provides an image-forming device comprising:

condition-setting means for setting the reference
value of specific device information in the above
20 device information as a condition;

According to the ninth aspect of the present invention, it is possible to easily extract the information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a tenth aspect of the present invention provides the image-forming according to the eighth aspect, in which the image-forming means has a function for printing out the above character-image data by coloring or modifying the data in accordance with preset conditions when printing out the above device information.

According to the tenth aspect of the present invention, it is possible to easily extract the information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, an eleventh aspect of the present invention provides the image-forming according to the eighth aspect, in which the image-data-generating means has a function for determining whether an item designated by a user meets a condition designated by the user when generating a number-of-sheets-used-information list or report every user group and when the item meets the condition, generating character-image data by coloring the item with a color designated by the user or applying character-string modification

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to the item in accordance with a modification method designated by the user, and

the image-forming means image-forming means has a function for printing out the character-image data generated by the image-data-generating means by
 5 coloring the character-image data with a color designated by the user or applying character-string modification to the data in accordance with a modification method designated by the user.

10 According to the eleventh aspect of the present invention, it is possible to easily extract the information intended by a user when printing out a section control information report or the like in accordance with the data output from the image-forming
 15 device.

Furthermore, a twelfth aspect of the present invention provides the image-forming device of the eighth aspect, in which the image-data-generating means has a function for generating character-image data by
 20 applying respectively-inherent character modification to the specific device information under a plurality of conditions, and

the image-forming means has a function for printing out character-image data by applying
 25 respectively-inherent character modification to the specific device information or the specific control information under a plurality of conditions.

According to the twelfth aspect of the present invention, it is possible to extract more information intended by a user when printing out a list or report in accordance with the data output from the image-

5 forming device.

Furthermore, a thirteenth aspect of the present invention provides the image-forming according to the eighth aspect, in which the image-forming means has a function for printing out the device information by stepwise coloring the character-image data with a respectively-inherent color in accordance with a plurality of preset conditions about one item.

According to the thirteenth aspect of the present invention, it is possible to easily extract more information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

Furthermore, a fourteenth aspect of the present invention provides the image-forming according to the eighth aspect, in which the image-data-generating means has a function for determining whether to meet any stage of a plurality of conditions designated by a user about one item designated by the user when generating a number-of-sheet-used-information list or report every user group and generating character-image data by coloring the data with a color designated by the user in accordance with a stage meeting one of the

conditions, and

the image-forming means has a function for
printing out the character-image data by coloring the
data with a color designated by the user in accordance
5 with a stage meeting one of the conditions.

According to the fourteenth aspect of the present
invention, it is possible to extract the information
intended by a user at a plurality of stages when
printing out a section-control-information report or
10 the like in accordance with the data output from the
image-forming device.

To achieve the above object, the fifteenth aspect
of the present invention provides a method for
controlling an image-forming device, comprising:

15 holding inherent device information including
the control information to be possessed by the image-
forming device;

setting a reference value to specific device
information of the above device information as
20 a condition;

fetching the device information, determining
whether the device information meets the above
condition, adding predetermined color information to
the device information in accordance with the
25 determination result, and converting the device
information including the predetermined color
information into character-string data;

converting the character-string data into
character-image data;

storing the character-image data in a memory; and

reading character-image data from the memory and

5 forming an image based on the character-image data on
an image-recording medium,

wherein the image formation is performed by
applying coloring or character modification to the
specific device information under a specific condition
10 and printing out data.

According to the fifteenth aspect of the present
invention, it is possible to simplify information
extraction intended by a user when printing out a list
or report in accordance with the data output from the
15 image-forming device.

Furthermore, a sixteenth aspect of the present
invention provides the method for controlling an image-
forming according to the fifteenth aspect, in which the
image formation is performed by printing out the device
20 information by coloring or modifying the character-
image data in accordance with a preset condition.

According to the sixteenth aspect of the present
invention, it is possible to extract the information
intended by a user when printing out a list or report
25 in accordance with the data output from the image-
forming device.

Furthermore, a seventeenth aspect of the present

invention provides the method for controlling an image-forming according to the fifteenth aspect, in which the above image-data generation is performed by determining whether an item designated by a user meets a condition
5 designated by the user when generating a number-of-sheets-used-information list or report every user group and, generating character-image data by coloring the data with a color designated by the user or applying character-string modification to the data in accordance
10 with a modification method designated by the user when meeting the condition, and

the image formation is performed printing out character-image data generated by coloring the data with a color designated by the user or applying
15 character-string modification to the data by a modification method designated by the user.

According to the seventeenth aspect of the present invention, it is possible to easily extract the information intended by a user when printing out
20 a section-control-information report or the like in accordance with the data output from the image-forming device.

Furthermore, an eighteenth aspect of the present invention provides the method for controlling an image-forming device according to the fifteenth aspect,
25 in which the image-data generation is performed by generating character-image data by applying

respectively-inherent character modification to the specific device information under a plurality of conditions, and

5 the image formation is performed by printing out character-image data generated by applying respectively-inherent character modification to the specific device information under a plurality of conditions.

10 According to the eighteenth aspect of the present invention, it is possible to extract more information intended by a user when printing out a list or report in accordance with the data output from the image-forming device.

15 Furthermore, a nineteenth aspect of the present invention provides the method for controlling an image-forming device according to the fifteenth aspect in which the image formation is performed by printing out the character-image data by stepwise coloring the data with a respectively-inherent color in accordance with
20 a plurality of preset conditions.

According to the nineteenth aspect of the present invention, it is possible to simplify complex information extraction intended by a user when printing out a list or report in accordance with the data output
25 from the image-forming device.

Furthermore, a twentieth aspect of the present invention provides the method for controlling an

image-forming device according to the fifteenth aspect,
in which the image-data generation is performed by
determining whether to meet any stage of a plurality
of conditions designated by a user about an item
5 designated by the user when generating a number-of-
sheets-used-information list or report every user group
and generates character-image data by coloring the data
with a color designated by the user in accordance with a
stage meeting one of the conditions, and

10 the image formation is performed by printing out
the character-image data generated by coloring the data
with a color designated by the user in accordance with
a stage meeting one of the above conditions.

According to the twentieth aspect of the present
15 invention, it is extract information in the plural
stages intended by a user when printing out a section
control information report in accordance with the data
output from the image-forming device.

Additional objects and advantages of the invention
20 will be set forth in the description which follows, and
in part will be obvious from the description, or may
be learned by practice of the invention. The objects
and advantages of the invention may be realized and
obtained by means of the instrumentalities and
25 combinations particularly pointed out hereinafter.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

The accompanying drawings, which are incorporated

in and constitute a part of the specification,
illustrate presently preferred embodiments of the
present invention and, together with the general
description given above and the detailed description of
the preferred embodiments given below, serve to explain
the principles of the present invention.

FIG. 1 is a perspective view showing an appearance of a composite-type image-forming device (multifunction-type copying device) of one embodiment of the present invention;

FIGS. 2A and 2B are schematic views showing an internal configuration of the composite-type image-forming device in FIG. 1;

FIG. 3 is a block diagram showing a system configuration of a control system of a composite-type image-forming device of an embodiment of the present invention;

FIG. 4 is an illustration showing a configuration of a an operation panel of the composite-type image-forming device in FIG. 1;

FIG. 5 is a block diagram showing a configuration of the touch-panel display of the operation panel in FIG. 4;

FIG. 6 is a functional-module diagram showing a conceptual configuration of control software blocks constituting an image-forming device of the present invention;

the present invention; and

5 DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the presently preferred embodiments of the invention as illustrated in the accompanying drawings, in which like reference numerals designate like or corresponding parts.

Embodiments of the present invention are described below by referring to the accompanying drawings.

FIG. 1 is a perspective view showing an appearance of a composite-type image-forming device (multifunction-type copying machine) of an embodiment of the present invention.

That is, as shown in FIG. 1, an automatic document feeder (hereafter referred to as ADF) 207 for automatically feeding sheet-like documents one by one and also serving as a document cover is set on a device body 200 so that it can be opened and closed.

Moreover, an operation panel 202 provided with various operation keys for designating copying conditions and start of copying and various indicators is provided at the upper front of the device body 200.

The operation panel 202 will be described later in detail.

body 200.

In this case, the parallel port connects the present device to an external device, such as a PC, (personal computer) when the present image-forming device operates as a printer.

Moreover, the serial port connects the present image-forming device to an external device, such as a PC, in order to read the internal control information of the present image-forming device and set functions of the present image-forming device when the present image-forming device is maintained.

Furthermore, the SCSI allows command/data communication between the present image-forming device and an external controller operating as a master.

FIGS. 2A and 2B are schematic views showing the internal configuration of the composite-type image-forming device in FIG. 1.

A scanner section 50 serving as obtaining means for obtaining image data and a printer section 52 serving as image-forming means are provided in the device body 200 in order to realize a copying function and a facsimile function.

Moreover, a read object, that is, a document-mounting table 212 made of transparent glass on which a document D is mounted and an ADF 207 for automatically feeding a document onto the document-mounting table 212 are arranged on the upper face of the device body 200.

The ADF 207 is set on the document-mounting table 212 so that it can be opened and closed and also functions as a document holder for bringing the document D mounted on the document-mounting table into close contact with the document-mounting table 212.

Moreover, the ADF 207 is provided with a document tray 208 to which the document D is set, an empty sensor 209 for detecting presence or absence of a document, pickup roller 214 for taking out documents from the document tray one by one, a sheet-feeding roller 215 for carrying a taken-out document, an aligning-roller pair 216 for arranging front ends of documents, an aligning sensor 286 provided for the upstream side of the aligning-roller pair to detect arrival of a document, a side sensor 287 for detecting the size of the document D, and a carrying belt 218 set so as to almost cover the whole of the document-mounting table 212.

Moreover, a plurality of documents set on the document tray 208 by being turned upward are taken out from the page immediately under the documents, that is, from the final page, arranged by the aligning roller pair 212, and carried to a predetermined position of the document-mounting table 212 by the carrying belt 218.

Furthermore, a reversing roller 220, non-reversing roller 221, a flapper 222, and a sheet-feed roller 223

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are arranged at the end of the ADF 207 opposite the aligning-roller pair 216 at the both side of the carrying belt 218.

5 The document D from which image information is read by the scanner section 50 to be described later is delivered from the document-mounting table 212 by the carrying belt 218 and ejected onto a document-ejecting section 224 on the upper face of the ADF 207 through the reversing roller 220, flapper 221, and sheet-
10 ejecting roller 222.

Moreover, when reading the back of the document D, the document D carried by the carrying belt 218 is reversed by the reversing roller 220 by changing the flappers 222 and then, sent to a predetermined position
15 on the document-mounting table 212 by the carrying belt 218 again.

The ADF 207 is provided with a sheet-feeding motor for driving the pickup roller 214, sheet-feed roller 215, and aligning-roller pair 216 and a carrying motor
20 for driving the carrying belt 218, reversing roller 220, and sheet-feed roller 223.

Moreover, the scanner section 50 set in the device body 200 has a light source 225 such as a fluorescent lamp for illuminating the document D mounted on the
25 document-mounting table 212 and a first mirror 226 for deflecting the light reflected from the document D in a predetermined direction.

The light source 225 and first mirror 226 are set to a first carriage 227 set below the document-mounting table 212.

5 A size sensor (not illustrated) for detecting the size of a document mounted on the document-mounting table 212 is set on the first carriage 216.

In this case, the first carriage 227 is set so as to be movable in parallel with the document-mounting table 212 and reciprocated below the document-mounting
10 table by a driving motor through a not-illustrated toothed belt or the like.

Moreover, a second carriage 228 is set below the document-mounting table 212 so as to be movable in parallel with the document-mounting table 212.

15 Second and third mirrors 230 and 231 for successively deflecting the light deflected by the first mirror 226 and reflected from the document D are set to the second carriage 228 so as to be perpendicular to each other.

20 The second carriage 228 is driven by the first carriage 227 by a toothed belt or the like and is moved along the document-mounting table 212 at half the speed of the first carriage, in parallel with the first carriage 227.

25 Moreover, an imaging lens 232 for converging the light reflected from the third mirror 232 on the second carriage 228 and a CCD sensor 234 for receiving and

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photoelectrically converting the reflected light converged by the imaging lens 232 are arranged below the document-mounting table 212.

5 The imaging lens 232 is movably set in a plane including the optical axis of the light deflected by the third mirror 231 through a driving mechanism to image reflected light at a desired magnification in accordance with self movement.

10 Moreover, the CCD sensor 234 photoelectrically converts the incoming reflected light and outputs an electrical signal corresponding to the read document D.

Furthermore, the printer section 52 is provided with a laser aligner 240 serving as exposure means.

15 The laser aligner 240 is provided with a semiconductor laser 241 serving as a light source, a polygon mirror 236 serving as a scanning member for continuously deflecting a laser beam emitted from the semiconductor laser 241, a polygon motor 237 serving as a scanning motor for rotating the polygon mirror 236 at
20 a predetermined revolving speed to be described later, and an optical system 242 for deflecting a laser beam emitted from the polygon mirror 236 and guiding the beam to a photosensitive drum to be described later.

25 The laser aligner 240 having the above configuration is fixed to and supported by a support frame of the device body 200, to be described later.

The semiconductor laser 241 is turned on/off in

accordance with the image information of the document D read by the scanner section 50.

5 A laser beam emitted from the semiconductor laser 241 is directed to photosensitive drums 244a to 244d by the polygon mirror 236 and optical system 242 to form an electrostatic latent image on each drum periphery by scanning the photosensitive-drum peripheries.

10 Moreover, the image-forming section 52 has rotatable photosensitive drums 244a to 244d serving as image-carrying bodies arranged at the approximate center of the device body 200.

15 A desired electrostatic latent image exposed by a laser beam emitted from the laser aligner 240 is formed on peripheries of the photosensitive drums 244a to 244d.

20 The following are arranged in order around the photosensitive drums 244a to 244d: an electrification charger 245 for electrifying drum peripheries to a predetermined electric charge, a development device 246 for supplying toner serving as a developer to an electrostatic latent image formed on peripheries of the photosensitive drums 244a to 244d and developing the image at a desired image density, a removal charger 247 for removing the material to be transferred supplied from sheet-feeding cassettes 252, 253, 254, 255, and 257, that is, for removing a copying sheet P from the photosensitive drums 244a to 244d, a transfer charger

248 for transferring a toner image formed on the
photosensitive drums 244a to 244d to the paper P,
a removal nail 249 for removing the copying sheet from
the peripheries of the photosensitive drums 244a to
244d, a cleaner 250 for removing toner remaining on
the peripheries of the photosensitive drums 244a to
244d, and a static eliminator (not illustrated) for
eliminating static electricity from the peripheries of
the photosensitive drums 244a to 244d.

10 The sheet-feeding cassettes 252, 253, and 254
which can be drawn from the device body 200 are
arranged in a stacked state below the device body 200.

Copying sheets different from each other in size are set in the cassettes 252, 253, and 254.

15 A large-capacity sheet-feeding cassette 255 is set
to sides of these cassettes 252, 253, and 254.

About 3,000 copying sheets to be frequently used such as A4-size copying sheets can be housed in the large-capacity sheet-feeding cassette 255.

Moreover, a sheet-feeding cassette 257 also serving as the manual tray 256 are removably set above the large-capacity sheet-feeding cassette 255.

A carrying route 258 extended from each cassette by passing through a transfer section located between the photosensitive drums 244a to 244d and the transfer charger 248 is formed in the device body 200.

A fixing device 260 is set to the dead end of

the carrying route 258.

An ejection port 261 is formed on the sidewall of the device body 200 opposite to the fixing device 260.

A finisher 300 is set to the ejection port 261.

5 The finisher 300 will be described later in detail.

A pickup roller 263 for taking out sheets from a cassette one by one is set nearby the sheet-feeding cassettes 252, 253, 254, 255, and 257 respectively.

10 Moreover, many sheet-feed-roller pairs 264 for carrying the copying sheet P taken out by the pickup roller 263 through the carrying route 258 are set to the carrying route 258.

A resist-roller pair 265 is set to the upstream side of the photosensitive drums 244a to 244d in the carrying route 258.

The resist-roller pair 265 corrects any inclination in the taken-out copying sheet P, matches the front end of a toner image on the photosensitive drums 244a to 244d with the front end of the copying sheet P, and feeds the copying sheet P to the transfer section at the speed equal to the moving speed of peripheries of the photosensitive drums. Moreover, an aligning sensor 266 for detecting arrival of the copying sheet P is set to this side of the resist-roller pair 265, that is, the sheet-feed roller-264 side.

The copying sheet P taken out from each cassette

by the pickup roller 263 one by one is sent to the resist roller pair 265 by the sheet-feed-roller pairs 264.

Then, the copying sheet P is sent to the transfer section after the front end of the sheet P is adjusted by the resist roller pair 265.

A developer image formed on the photosensitive drums 244a to 244d, that is, a toner image is transferred onto the sheet P by the transfer charger 248.

The copying sheet P to which the toner image is transferred is removed from peripheries of the photosensitive drums 244a to 244d by actions of the removal charger 247 and removal nail 249 and carried to the fixing device 260 through a carrying belt 267 constituting a part of a carrying route 252.

Then, the developer image is melted and fixed to the copying sheet P by the fixing device 260 and then, the copying sheet P is ejected to the sheet ejection tray 362 of the finisher 300 through the ejection port 261 by the sheet-feed-roller pair 268 and a sheet-ejection-roller pair 269.

An automatic double-side device (ADD) 270 for reversing the copying sheet P passing through the fixing device 260 and resending the sheet P to the resist roller pair 265 is set below the carrying route 258.

The automatic double-side device 270 is provided with a temporarily storing section 271 for temporarily storing the copying sheet P, a reversal route 272 branched from the carrying route 258 to reverse the copying sheet P passing through the fixing device 260 and guide it to the temporarily storing section 271, a pickup roller 273 for taking out the copying sheet P from the temporarily storing section one by one, and a sheet-feed roller 275 for feeding a taken-out sheet to a resist roller pair 2655 through a carrying route 274.

Moreover, a distribution gate 276 for selectively distributing the copying sheet P to the ejection port 261 or reversal route 272 is set to the branch portion between the carrying route 258 and the reversal route 272.

When performing double-side copying, the copying sheet P passing through the fixing device 260 is guided to the reversal route 272 by the distribution gate 276 and temporarily stored in the temporarily storing section 271 while reversed, then sent to the resist roller pair 265 through the carrying route 274 by the pickup roller 273 and sheet-feed roller pair 275.

Then, the copying sheet P is position-adjusted by the resist roller pair 265 and sent to the transfer section again, and a toner image is transferred to the back of the copying sheet P.

Thereafter, the copying sheet P is ejected to the sheet-ejection tray 362 of the finisher 300 through the fixing device 260 and sheet-ejection roller 269.

Moreover, by using the automatic double-side device 270, it is possible to eject a sheet by turning the printed face of a sheet downward.

That is, similarly to the procedure for performing double-side copying, a sheet on whose surface an image is transferred and fixed is temporarily stored in the temporary storing section 271.

Then, the sheet temporarily stored in the temporarily storing section 271 is passed through the carrying route 274 by the pickup roller 273 and sheet-feed roller pair 275 and position-adjusted by the resist roller 265 and then, ejected to the sheet-ejection tray 362 through the fixing device 260 and sheet-ejection roller 269.

FIG. 3 is a block diagram showing a configuration of a control system of the composite-type image-processor in FIG. 1.

The control system has a system CPU 101, a flash ROM 102 connected to the system CPU 101 to store a program and data, a DRAM 103 for performing operations and storing data, and a nonvolatile RAM (NVRAM) 104.

Moreover, the control system has a font ROM 106 connected to the system CPU 101 through a system bus 105, an operation panel 107, a hard-disk drive (HDD)

108, and a LAN interface 109.

Furthermore, the control system has an image processing circuit (IPU) 110 to be described later connected to the system CPU 101 through the system bus 105, a printer controller (PRNC) 111, and an image memory (PM) 100.

Furthermore, a scanner 112 and a scanner interface (SIF) 113 to be described later are connected to the front stage of the image processing circuit (IPU) 110.

Furthermore, a printer interface (PIF) 114 and a printer 115 to be described later are connected to the rear stage of the image processing circuit (IPU) 110.

The system CPU 101 of the control system controls the whole of the present device. In this case, however, the system CPU 101 controls functions in accordance with designations from the operation panel 107, signals input from a communication line, or signals input from various external interfaces.

The SIF 113 serves as a scanner interface for receiving image data from the scanner 112.

The SIF 114 serves as a printer interface for transmitting image data.

The IPU (Image Processing Unit) 110 serving as an image processing circuit serves as an image-processing section for performing image edition such as image-quality improvement, expansion and contraction, pixel thinning, and whitening of a designated area by marker

detection corresponding to the printer 115 serving as a recorder.

These devices 110 to 115 are connected to each other through an image bus.

5 Control signals are transferred between the system CPU 101 and the devices 110 to 115 through the system bus 105 at high speed.

Moreover, the image bus is a unique bus to be used for the composite-type image processor to operate as
10 a copying machine.

That is, to assure real-time operations of the copying machine, operations of receiving the image data input from the scanner 112 by the SIF 113 through the image bus, applying image-quality improvement,
15 expansion/contraction, and various editing of the image data, and outputting the data to the printer 115 through the PIF 114 in parallel are executed in parallel (these operations are referred to as basic copying).

20 Among the boards connected to the image bus, a processing board unnecessary for the then operation is brought into a passing state.

Moreover, the PRNC 111 has an interface with the printer section 115 for controlling the image-forming
25 function under copying or printer operations and also serves as a printer controller connected to a LAN through a device such as an NIC (Network Interface

Card) to perform the protocol control and data transfer/compression/expansion control for receiving print data from an external device such as PC through the LAN, buffering the data, and transferring the data to the printer section 115.

Furthermore, the image memory (PM) 100 is a memory having a CODEC and a page buffer, described later, to temporarily store image data.

FIG. 4 is an illustration showing a configuration of the operation panel 107.

As shown in FIG. 4, the operation panel 107 is provided with a touch-panel display 116 using an LCD serving as a display device, a start key 117, a stop key 118, a clear key 119, a ten-key pad 120 for setting numerals, a key 121 for selecting a document size or a cassette, an LED 122 for displaying a selected document size or cassette, a copying-magnification-setting key 123, a processing-mode-selection key 124, and various selection keys 125 and 126 and a density-setting key 127 so that a color or monochrome mode can be designated.

Moreover, not only ten keys from "0" to "9" but also keys such as "*", ",", "@", and "_" are provided for the key pad 120 so that they can be used for copying control as well as inputting mail addresses.

For example, five copies are obtained by selecting "COPY" with the processing-mode-selection key 124 to

change the menu on the display 116 to copying,
selecting a desired processing (such as image copying),
and pressing the key "5" on the ten-key pad 120.

Then, the numeral "5" is displayed in a specific
5 area on the touch-panel display 116.

When a user confirms the numeral and sets a
document, and presses the start key 117, copying is
started.

FIG. 5 is a block diagram showing how the various
10 sections of the above touch-panel display 116 are
connected.

The touch-panel display 116 is constituted by
setting the touch-panel 128 on a liquid-crystal
display 129.

15 A touch panel 128 is constituted by uniformly
applying transparent resistors on a transparent
substrate and arranging transparent electrode groups
in parallel at predetermined intervals in X and Y
directions.

20 Moreover, voltages are successively applied to
the X- and Y-directional transparent electrodes of the
touch panel 128 in certain directions under the control
of a touch-panel control section 130.

A position is designated to the touch panel 128
25 by using an exclusive conductive pen or a finger.

The touch-panel control section 130 monitors
the resistance value between electrodes in X and

Y directions and detects a position at which a resistance value is locally reduced in accordance with a designation by a conductive pen or finger through an operation in accordance with the resistance value
5 between electrodes.

Moreover, the liquid-crystal display 129 is connected to a display control section 131 for display-driving the display 129, and a video RAM (VRAM) 132 for storing display data in display pixels as a device-
10 information-holding module for holding inherent device information including the control information to be possessed by an image-forming device.

In the case of the touch panel display 116 serving as a user interface, described later, constituted as
15 described above, the position data obtained by the touch-panel control section 130 is read by the system CPU 101 in a main control section and the processing corresponding to the position data is executed by the system CPU 101.

For example, to perform handwriting input, the data on the VRAM 132 corresponding to a position designated on the touch panel 128 is inverted from a non-display state to a display state and a keyboard display and various setting buttons are displayed on
25 the liquid-crystal display 129.

Then, it is possible to use the touch panel display 116 for various purposes such as inputting of

an operation parameter selected by a user from the various setting buttons displayed on the liquid-crystal display 129.

FIG. 6 is a module diagram showing a conceptual configuration of hardware elements and control software blocks constituting the image-forming device of the present invention.

In FIG. 6, a modification-information-setting-section module 141 and a modification-condition-setting-section module 142 are constituted by the operation panel 107 of the present device described for FIGS. 4 and 5 and display control software for controlling the modules 141 and 142.

In this case, as shown in FIGS. 10A and 10B, the modification-information-setting-section module 141 and modification-condition-setting-section module 142 serve as user interfaces and display a modification-condition-setting screen and a modification-content-setting screen on the operation panel 107, set the color, type of character modification, and modification content of the image data to be output, and store their setting contents in the NVRAM 104 in FIG. 3.

These modules function as condition-setting modules for setting a reference value of specific device information in the above device information as a condition.

Moreover, in FIG. 6, a modification-information-generating-section module 143 determines whether device control information meets conditions for performing various preset character modifications in accordance with the contents set by a coloring-information setting section and a coloring-condition setting section, decides the character information to be generated and the type of color in an area about the type of character modification, and generates formatted list data including modification codes as shown in FIG. 15 to be described later.

Furthermore, an image-data-generating-section module 144 develops actual image data on a page buffer in accordance with the formatted list data (refer to FIG. 15) generated by the modification-information-generating-section module 143 and the font data stored in the font ROM 106 in FIG. 3 and adds a modification code to the image data as described later.

Then, the image-data-generating-section module 144 repeats generation of these processings about the whole data every line and when generation of image data for one page is completed, compresses the data and stores the data in the HDD 108 in FIG. 3.

Moreover, after the image-data-generating-section module 144 executes the above operations for all pages, it directs an input/output-operation-control-section module 145 to start printing.

In FIG. 6, the input/output-operation-control-section module 145 includes the image-processing unit (IPU) 110 in FIG. 3 and has an interface with an output (printer)-control-section module 146 to be described later and is constituted by the so-called control software for executing a job control function to properly direct the output (printer)-control-section module 146 to start or interrupt an operation for the image data stored in the HDD 108 while checking the operating state of the whole device.

Moreover, the input/output-operation-control-section module 145 not only controls its jobs but also computes image-processing parameters and sets the parameters to the image-processing unit.

In FIG. 6, the output(printer)-control-section module 146 is constituted by printer-operation-control firmware for a printer device, a printer-control ASIC, an output-side image processing ASIC, and printer-operation-control firmware for performing printer control and sheet-carrying control under printing, and printer-side image-processing firmware.

The output(printer)-control-section module 146 has an interface with the printer controller 111 in FIG. 3 to perform communication of commands such as a control command and a status and print-data communication control.

Moreover, the output(printer)-control-section

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module 146 has an individual control CPU to realize high-speed controls.

These controls perform command-status communication between the output (printer)-control-section module 146 and the system CPU 10 in FIG. 3 and control synchronous operations between a display, a scanner, and a printer to realize copying and printing-out operations of the whole device.

FIG. 7 is an illustration showing the flow of control of the present system.

As shown in FIG. 7, an item in which character modification may occur and the type of modification in the above case, and a threshold value generated by the type of modification are set in modification-information/modification-condition-setting-section modules 141 and 142.

Then, the above conditions are collated with machine information in the modification-information-generating-section module 143 to generate character-string information to be supplied to the image-data-generating-section module 144.

Specifically, the modification-information-generating-section module 143 adds a modification code to each character string and moreover adds a line-feed code and a page-feed code to each character string.

After the modification-information-generating-section module 143 generates these pieces of

information, it supplies character-string information to the image-data-generating-section module 144.

Thereby, the image-data-generating-section module 144 starts generation of image data.

5 Specifically, the image-data-generating-section module 144 reads font data from the character-string information through a bit-map-generating module 150 and generates bit-map data on the DRAM 103 serving as a main memory every line.

10 The bit-map data is converted into a color format comprising brightness information and color-difference information and then, developed on a page buffer 100a in the image memory (PM) 100 in FIG. 3.

The color format is gradation data in which one
15 block is constituted by $N \times N$ pixels as shown in FIG. 8.

FIG. 8 shows a state in which the brightness component of each pixel of the color format is expressed by k bits, color-component information is added to the bits every block to develop the bits on
20 the page buffer 100a.

Moreover, for the color-difference information, it is possible to optionally operate color information by setting a proper value as shown in FIG. 8.

Image data is compressed when the data for one
25 page is developed and then, stored in a storage medium such as the HDD 108.

When the same processing is completed for the data

sector are stored in the NVRAM 104 in the form of a table.

In this case, the actual numbers of copies and prints every sector are stored or -1 is stored for a warning value and color information.

FIG. 9B shows that a warning value or color information is not entered in the second sector.

Moreover, pieces of warning-value information entered through user interfaces shown in FIGS. 10A and 10B are entered every sector.

These pieces of the information are stored in the nonvolatile memory (NVRAM) 104 and read and updated according to necessity.

FIGS. 10A and 10B are illustrations showing images of operation screens serving as user interfaces for setting conditions in the modification-information/modification-condition-setting-section modules 141 and 142 when adding the above color information.

For example, to set conditions for the number of copies or the number of prints out of the data showing the working state of a device when outputting a control-information list, a user selects a corresponding icon in FIG. 10A.

Then, as shown in FIG. 10B, a threshold value for the number of copies or the number of prints and a character-color setting screen are displayed.

This example shows that it is possible to set

three levels of threshold values for the number of
copies or the number of prints. For example, it is
possible to set the number of copies or the number of
prints so as to change colors in accordance with a
5 condition such as "red" between 200 and 1,000, "blue"
between 1,000 and 1,500, or "green" for 1,500 or more.

FIG. 11 is a flowchart showing a control sequence
by the modification-information-generating-section
module 143.

10 First, the modification-information-generating-
section module 143 obtains an output format in step
S101 and the data for an item to be output in step S102
and then determines in step S103 whether a threshold
value is set to machine control information to be
15 output.

In this case, when any threshold value is set in
step S103, the modification-information-generating-
section module 143 compares the machine control
information set in accordance with the mode shown in
20 FIGS. 9A and 9B with a user-set threshold value.

The control information in the above case shows
the data inherent in a machine such as the number of
copies to be used every sector.

Then, the modification-information-generating-
25 section module 143 determines which is larger, the
machine control information or the user-set threshold
value in step S105. When a larger value exceeds the

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modification-information generation also for other machine control information in step S110.

Then, when information generation is completed for the whole machine control information, the
5 modification-information-generating-section module 143 adds a page-feed code in step S111 and then, executes the code generation for all pages.

Then, when the code generation for all pages is completed, the modification-information-generating-
10 section module 143 directs the image-data-generating-section module 144 to generate image data and then, completes processing.

FIG. 12 is a flowchart showing a control sequence by the image-data-generating-section module 144.

15 First, the image-data-generating-section module 144 secures the DRAM 103 serving as a work memory for developing font data and a work memory for developing the conversion data to be pasted to the page buffer 100a in step S121.

20 Then, the image-data-generating-section module 144 initializes a memory to be used in the page buffer 100a in step S122.

Then, the image-data-generating-section module 144 obtains the character modification data generated
25 through the processing shown in FIG. 11 in step S123, and obtains font data from a character code and develops the data on the memory in step S124.

Then, the image-data-generating-section module 144 converts the data into an actual character size in step S125 and moreover, converts the data into the format of brightness data + color-difference data every 5 N*N pixels in step S126 as shown in FIG. 8.

Then, the image-data-generating-section module 144 continues the above processings until a line termination code is detected in step S127. When generating the data for one line, the image-data-generating-section module 144 pastes the data in 10 the page buffer 100a shown in FIG. 7 in step S128.

Moreover, the image-data-generating-section module 144 repeats these processings every one line until a page termination code is detected in step S129. 15 When the processings for one page are completed, the image-data-generating-section module 144 compresses the developed data and stores the compressed data in the HDD 108 in step S130.

Then, the image-data-generating-section module 20 144 repeats the above processings for the whole data generated through the processings in FIG. 11 every page in step S131. When all processings are completed, the image-data-generating-section module 144 directs the input/output-operation-control-section module 145 to 25 start printing in step S132 and then the flow ends.

FIG. 13 is a flowchart showing a control sequence by the input/output-operation-control-section

module 145.

First, when start of printing is designated, the input/output-operation-control-section module 145 enters designated printing JOB in a printing queue.

5 The printing queue successively accepts various printing jobs such as copying and print data and stores the priority every job, entry time, file name, and file-attribute information (such as page size and number of sheets).

10 Then, the input/output-operation-control-section module 145 determines in step S143 whether a printing-start timer interrupt is present. When detecting the printing-start timer interrupt, the input/output-operation-control-section module 145 fetches the head
15 printing job from the printing queue.

 Then, the input/output-operation-control-section module 145 determines in step S145 whether a printing job is present in the queue. When a printing job is present, the input/output-operation-control-section
20 module 145 further obtains a machine operating state in step S146.

 When no printing job is present in the printing queue, the input/output-operation-control-section module 145 skips to step S149 to set a printing-start
25 timer and is brought into a waiting state.

 Then, the input/output-operation-control-section module 145 repeats processings in and after step S143,

fetches a job from the printing queue similarly to the above described, obtains a machine state, and starts printing.

In this case, though not illustrated, the machine operating state denotes the data showing factors for controlling whether to execute a printing job such as an error occurrence state, other job execution state, low-power-consumption mode state, remaining-number-of-sheets information, and holding-size information or denotes normally-controlled states in the machine-information-control TBL shown in FIG. 7.

Then, the input/output-operation-control-section module 145 determines in step S147 whether the present state is a printing-possible state by comparing the above data values with the attribute information of a printing job. When the present state is the printing-possible state, the input/output-operation-control-section module 145 communicates start of printing to the output(printing)-control-section module 146 in step S148.

In this case, when the present state is a printing-impossible state, the input/output-operation-control-section module 145 skips to step S149 to set the next printing-start timer and waits.

Then, the input/output-operation-control-section module 145 determines whether the normal end of printing is received from the output

(printing)-control-section module 146. When the normal end is received, the input/output-operation-control-section module 145 skips to step S154 to communicate the normal end to the display control section in the system CPU 101 and then skips to step S156 to delete a corresponding list-printing job from the printing queue shown in FIG. 7 and the flow ends.

Moreover, when the normal end is not received, the input/output-operation-control-section module 145 determines in step S151 whether interrupt of printing is received from the output(printing)-control-section module 146. When the interrupt of printing is received, the input/output-operation-control-section module 145 sets a printing-start timer in step S153 and is brought into a waiting state.

When the interrupt of printing is not received, the input/output-operation-control-section module 145 repeats processings in and after step S150.

When the interrupt factor is canceled and the present state shifts to a printing-possible state, the input/output-operation-control-section module 145 repeats processings in and after step S143, fetches a job from the printing queue as described above at the timing of a printing-start-timer interrupt, obtains a machine state, and restarts printing.

FIG. 14 is a flowchart showing a control sequence by the output(printing)-control-section module 146.

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First, when start of printing is designated by the input/output-operation-control-section module 145 in step S161, the output(printing)-control-section module 146 obtains a printing job in step S162 and then,
5 determines in step S163 whether the present state is an operation-possible state.

In this case, printing-job conditions denote a print file name, sheet-feed source, data size, sheet size, number of pages, and double-side/single-side
10 printing information.

Moreover, when the present state is not the operation-possible state, the output(printing)-control-section module 146 skips to step S173 to determine whether the cause of the operation-impossible state is
15 a fatal error state.

In this case, even if the present state is not the fatal error state, it is impossible to execute printing when a designated sheet size or a sheet-feed source is improper. Therefore, the output(printing)-control-section module 146 communicates occurrence of an
20 interrupt state to the input/output-operation-control-section module 145 in step S174 and the flow ends.

Moreover, when the present state is a fatal error state such as a state in which a designated file name
25 is not present, the output(printing)-control-section module 146 communicates abnormal end to the input/output-operation-control-section module 145 in

step S175.

Then, when the output(printing)-control-section module 146 is in an operation-possible state, it initializes an area of the page buffer 100a to be used in step S164 and then, opens a corresponding file from the HDD 108 to fetch data and develops the data in the page buffer 100a.

Then, the output(printing)-control-section module 146 determines in step S166 whether development normally ends. When the data development normally ends, the module 146 sets a parameter for output to an image processing ASIC in step S167 and then, reads data from the page buffer 100a to print out the data in step S168.

However, when the data development does not normally end, the module 146 starts processings in and after step S173 to determine whether the present state is a fatal error state and performs processings.

When the printing-out normally ends, the output (printing)-control-section module 146 repeats these processings by the number of pages in step S170.

Then, when processings are executed up to the final page, the output (printing)-control-section module 146 communicates that the data development normally ends to the input/output-operation-control-section module 145 and completes processings in step S170.

FIG. 15 is an illustration showing formatted list data including the above format information.

In this case, the formatted list data is shown by a range in which one-line character code is enclosed by " " in aBuf shown in FIG. 15.

Moreover, an empty line is shown by "" and the final line is expressed by " LFLFLF".

Furthermore, color information can be expressed by eight colors such as C0, C1, ..., and C7 to be described later every area enclosed by , , .

Furthermore, for the color information, the data of a corresponding part of aData[8][2] shown in FIG. 15 is retrieved to obtain its header data.

In this case, C0 is expressed by black, C1 by red, C2 by blue, C3 by yellow, C4 by green, C5 by purple, C6 by yellowish green, and C7 by pink.

Then, the header data of C0 corresponds to 0x00110101.

Moreover, the header data of C2 corresponds to 0x01010011.

Furthermore, the header data of C3 corresponds to 0x01000001.

Furthermore, the header data of C4 corresponds to 0x01110100.

Furthermore, the header data of C5 corresponds to 0x11000010.

Furthermore, the header data of C6 corresponds to

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0x11100100.

Furthermore, the header data of C7 corresponds to
0x11111000.

5 These header data are added as the data showing
the color-difference information of the color format
shown in FIG. 8.

10 FIG. 16 illustrates results of developing the
formatted list data shown in FIG. 15 and printing out
the data in accordance with the control flows shown in
FIGS. 11 to 14.

15 In FIG. 16, underlines and characters "RED" and
"BLUE" in character strings are added for convenience'
sake so that processing results are easily understood
and show colors by which these character strings are
expressed.

Moreover, it is shown that portions to which these
underlines or characters "RED" and "BLUE" are printed
out in black.

20 In the case of actual output results, these
underlines or characters "RED" and "BLUE" added for
convenience' sake are not printed out.

25 Therefore, according to the present invention,
it is possible to provide an image-forming device and
a method for controlling the device making it possible
for a user to designate a modification method for the
information noted by the user in accordance with a
condition desired by the user when printing out machine

control information or operator information in the form of a list or report and print out the information noted by the user.

Additional advantages and modifications will
5 readily occur to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the
10 spirit or scope of the general inventive concept as defined by the appended claims and their equivalents.